# Table of Contents

Introduction .................................................................................................................. 3
Prior to Starting Your Rotation .................................................................................. 4
Resident Responsibilities ......................................................................................... 4
Education ................................................................................................................ 7
  Primary rotation ........................................................................................................ 7
  Advanced rotation ..................................................................................................... 8
Operating Room Checkout ....................................................................................... 11
Postoperative Operating Room Set-up .................................................................... 12
Prenesthesia Evaluation ......................................................................................... 13
Orders ..................................................................................................................... 13
Postanesthesia Evaluation ..................................................................................... 13
Placing an Epidural ................................................................................................. 14
  KEY POINTS .......................................................................................................... 18
Anesthesia Record for Labor Epidurals ................................................................... 20
Epidural Pumps & Cassettes .................................................................................... 21
  Setting up the epidural pump ................................................................................ 21
Billing & Compliance ............................................................................................. 22
Airway Cart and GlideScope .................................................................................. 24
Epidural Cart ........................................................................................................... 25
The Pyxis MedStation 3500 System ....................................................................... 25
Research ................................................................................................................ 27
Obstetric Anesthesia Pagers .................................................................................... 28
Anesthesia Office ..................................................................................................... 29
  Computer ................................................................................................................ 29
  Dry Erase Board ...................................................................................................... 29
Anesthesia Storage Room (room 4109 in the OR suite) ......................................... 29
Crisis Management Topics ..................................................................................... 32
  Total Spinal – High Spinal Anesthesia ................................................................. 32
  Emergency Cesarean Delivery ............................................................................ 35
  Amniotic Fluid Embolism ..................................................................................... 37
  Cardiac Arrest in the Parturient ........................................................................... 40
  Hypotension Following Neuraxial Anesthesia .................................................... 43
  Local Anesthetic Systemic Toxicity (LAST) ....................................................... 45
  Obstetric Hemorrhage ......................................................................................... 46
  Preeclampsia and Eclampsia ................................................................................. 49
Code “OB” ................................................................................................................. 53
  Massive Transfusion Protocol – UNMH ............................................................. 54
Appendix ...................................................................................................................... 56
  Pain during childbirth: What can we do about it? .......................................... 56
  Primary OB Anesthesia Rotation Educational Documentation ....................... 59
  Advanced OB Anesthesia Rotation Educational Documentation ..................... 60
Introduction

The idea of providing the residents with a handbook for this subspecialty rotation was conceived about thirteen-fourteen years ago. Dr. Frank Jaime is the original author. Every few years, every new rotation director has revised the manual with contributions from colleagues. Even though the last revision is only a year old, there have been several recent logistical, organizational, and educational changes that made this new edition necessary. A major contribution comes from Dr. Kate Gentry, former Chief Resident, who revised the crisis management topics.

This manual is designed to help you get started on the Obstetric Anesthesia rotation. It provides you with information that is specific to the delivery of obstetric anesthesia here at the University of New Mexico. All other information regarding obstetric anesthesia you will learn from textbooks and the different resources available to you during this rotation.

Our goal is to provide efficient delivery of high quality anesthesia services to the pregnant patient while furthering your knowledge in anesthesia. In order to achieve this goal, attention will need to be paid to the areas of patient care, education and training, research, administration, and facilities and equipment. You will be expected to participate in each of these areas while you are on your rotation.

You will be functioning as a part of the perinatal team, which includes anesthesiologists, obstetricians, family practitioners, nurse midwives, labor & delivery nurses, the birthing team (patient, husband, labor coach or doula, and family), neonatologists, surgical technicians, and the clerks. In order to provide high quality medical care to our patients, it is important to maintain open lines of communication between the different members. Courtesy, cooperation, communication, consideration, and compassion should always be practiced when dealing with our patients and the members of the perinatal team. If you have any problems in your interaction with these people, please discuss this with the Director of Obstetric Anesthesia or the anesthesia attending covering L&D.

Due to the nature of obstetrics, the demands for obstetric care can change very quickly. A scheduled cesarean delivery may be postponed for a laboring patient who requests labor analgesia or requires an urgent cesarean section for fetal distress. An increased number of laboring patients may result in no nurses being available to care for the elective cesarean delivery or post-partum tubal ligation, again delaying elective cases. It is therefore very important to remain flexible while you are on this rotation.

While you are on the obstetric anesthesia rotation, you are the primary anesthesia provider for the L&D suite. You will be expected to organize and run the Obstetric Anesthesia service via consultation with your attending. Obstetric emergencies can occur at any time so you will need to be immediately available at all times. If you have to leave the L&D floor, please make sure your attending is available for an emergency. You should also ask your attending to let you know when he or she needs to leave the unit for a short time.
By the time you finish your anesthesia training, you should have mastered a wide range of information in obstetric anesthesia. This information is laid out for you in the curriculum developed by the Society for Obstetric Anesthesia and Perinatology. The whole curriculum is incorporated in our discussion topics in the “Education” section and in the Goals and Objectives, which can be accessed both on New Innovations and on the departmental Intranet. You should review these topics and set a personal goal to cover all this information prior to completing your anesthesia training.

Welcome to the obstetric anesthesia rotation!

**Prior to Starting Your Rotation**

You should read the obstetric anesthesia chapter in your basic textbook.

You should find time to visit L&D to get an orientation and to make sure you have a functioning password for all Pyxis machines including the Pyxis Anesthesia System, two Pyxis MedStations in the work room and PACU, and the Pyxis SupplyStation within the OR suite. If you have problems, contact the Director of Obstetric Anesthesia prior to beginning your rotation. The epidural cassettes are kept in the workroom Pyxis MedStation. Medications requiring refrigeration (Methergine, Hemabate, insulin, cisatracurium, cefazolin, and saline for malignant hyperthermia protocol) are kept in the Pyxis MedStation in the PACU. Most anesthesia supplies are maintained in the Pyxis SupplyStation located in the Anesthesia Storage room in the OR area.

You should read the section on “Crisis Management” that is included in this manual. It is common for emergencies to occur in obstetrics, and they can occur on your first day, so you should be prepared to deal with them at a moment’s notice. You should have a clear plan in your mind as to how you will proceed. Be prepared to discuss this topic on the first day of your rotation.

**Resident Responsibilities**

**A checklist is posted in our work area; please refer to it every day.**

Residents should arrive each morning no later than 0645.

Hand-off:

The off-going resident should inform you of any complicated patients, problems with epidurals, patients requiring follow up, etc. Make sure the dry-erase board is updated with all the important information.
Obtain the OB anesthesia resident pager (951-1376) from the off-going resident. This pager should always be carried by a resident, or if the residents are in lecture, by the attending. The OB anesthesia attending pager (951-1375) is carried by the attending at all times. In case of emergency, the clerk will page 951-9931, the “STAT” number. This number activates both pagers simultaneously and immediately. Never leave this pager on the desk or attached to a mailbox. If you take it home accidentally, you need to return it.

OR suite:

Check ORs 13 and 14 and make sure they are ready for any emergency.
The airway cart in OR 14 should be checked to ensure that all necessary items are readily available. See the section on the “Airway Cart” for more information.
The GlideScope is kept in OR 14.
Then check OR 15 preferably before 0700 or immediately after board meeting.
Confirm the location of the crash cart across from OR 13. The L&D nurses check this cart on a daily basis.
The hemorrhage/MH cart in the anesthesia storage room should be fully stocked and ready to go. The medications in the cart are maintained by Pharmacy.

OB board rounds begin at 0700:

Before rounds, please print a copy of the ‘chalkboard” at the front desk.

Your presence is mandatory so that you are aware of any patients who may require epidurals, any high-risk patients, or any patients at risk for Cesarean section. Information vital to the care of the obstetric patients will be discussed at this time. Patients for elective Cesarean section, post-partum tubal ligation, cerclage, or version will be discussed at this time also. You are excused from board rounds only if there is an ongoing procedure requiring your presence. During board rounds you should also be on the lookout for patients who may be candidates for ongoing obstetric anesthesia research studies.

Write your name and pager number on the board in the OB boardroom.

Workroom:

There are two epidural carts in the workroom. They have to be locked when not in use. Epidural carts should be checked every morning. You should specifically ensure that all emergency supplies are present and in working order including laryngoscopes, endotracheal tubes and emergency drugs and the syringes did not expire. The anesthesia technicians should be notified of any missing items. If necessary you can restock the carts from supplies found in the Pyxis SupplyStation. Two WOWs (one with drawers that hold epidural supplies) are also kept in the workroom. They should be plugged in when not in use.
The dry erase board should be updated. See the “Dry Erase Board” for further information regarding this topic.

Evaluate all patients who have epidurals in place. You should introduce yourself to the patient and her nurse and let them know that you will be available for any anesthesia-related issues.

Elective cases should be in L&D by 0600 for blood draw for type and screen and you should plan on having them in the OR by 0800. Because of the ever-changing nature of L&D, you will need to be flexible on this. You should consult with the charge nurse and the OB resident running the board, to confirm start times for the elective cases.

Postoperative visits should be done as soon as possible. It often gets busy on L&D and it may become difficult to do the post-ops as the day progresses. The sooner you do them the better. You may need to do post-ops between cases. You are expected to do all the post-ops each day (including weekends). See the section on “Post-anesthesia Evaluation”.

Recruit patients for any ongoing research. See the section on “Research” for more information.

Plan time for the daily didactic discussion. This is a major factor in your education during this rotation so you should take personal responsibility for ensuring that these discussions take place. Please print the topic lists for both the primary and the advanced rotation; they can be found on the last pages of this manual. Make sure you have the attending sign the sheet when you complete a topic. Hand in the sheet to the rotation director at the end of the rotation in order to get credit.

All anesthetics performed during your shift will be your responsibility. You should inform your attending prior to the delivery of any anesthetic and discuss any complicated cases that might require anesthesia. You should check the OB board and talk to the obstetric residents on a regular basis to anticipate any possible emergencies.

It is your responsibility to turn over the anesthesia equipment after each OR case. See “Operating Room Checkout” section for further information on post-op operating room set-up.

While on this rotation you are still expected to attend anesthesia teaching conferences. There should not be a problem getting you out for these conferences as long as the workload at that time can be managed by the attending. You should remind the attending if necessary.

Handover in the afternoon should be the same as in the morning.

You are responsible for most issues related to the epidural pumps. The nurses will replace the epidural cassettes and pull the epidural catheter after delivery assuming the Labor Epidural Powerorders are completed. If a catheter should not be removed by the nurse
(because of research study, intrathecal catheter, coagulopathy, etc.), this should be discussed with the nurse as soon as you are aware and the appropriate box should be checked on the orders. When you pull an epidural catheter, be sure to make a notation on the anesthesia record. You should pull the intrathecal catheters yourself or may instruct the nurses to leave them in place, capped with the filter on, to be removed the following day by anesthesia. Preeclamptic patients with low platelet counts should not have their epidural catheter pulled unless the platelet count is greater than 75-100k (discuss this with your attending).

When you are on call during your obstetric anesthesia rotation, you will be expected to cover OB.

Prior to leaving you should ensure that the operating rooms are turned over, the office is neat and in order, and that the dry erase board is up to date. The OBA resident pager should be turned over to your relief.

**Education**

An updated reading list is included in the Goals and Objectives, which can be accessed both on the departmental Intranet and on New Innovations.

**Primary rotation:**

In order to assure that each resident has the opportunity to review the basic knowledge associated with obstetric anesthesia practice, the following topics will be addressed by the faculty during the month of the primary OB anesthesia rotation. It is anticipated that these reviews will usually take the form of case-based discussions or mini-lectures. It is expected that the residents will fill out the attached discussion topic worksheet and turn it in to the OBA rotation director at the end of their month. It will be considered a requirement for successful completion of the rotation that each resident document that faculty-led discussions have taken place covering a minimum of 12 of the topics listed below.

For each starred “*” category the resident should be able to demonstrate the following:

1. General understanding of how the disease impacts on pregnancy.
2. General understanding of how pregnancy impacts on the disease.
3. General understanding of the obstetric implications and management of the disease.
4. Ability to communicate the anesthetic implications of the disease to non-anesthesiologist colleagues attending the patient.
5. Assess the severity of disease and evaluate the need for patient transfer to a high-risk facility.
6. Describe the anesthetic management of the patient for vaginal or cesarean delivery.

**Topics**
1. The most common emergencies: emergency Cesarean delivery and post-partum hemorrhage

2. Other crisis topics:
   a. Failed intubation, difficult airway, and aspiration
   b. High spinal
   c. Maternal embolic events
   d. CPR in the obstetric patient
   e. Seizures in obstetrics, differential diagnosis and management

3. Maternal physiology

4. Fetal physiology and assessment; fetal and neonatal resuscitation

5. Non-regional labor analgesia (systemic, inhalation, non-pharmacologic)

6. Regional analgesia for labor and delivery; local anesthetics

7. Complications of neuraxial anesthesia:
   a. Hypotension
   b. Local anesthetic systemic toxicity
   c. Unintentional dural puncture
   d. Neural injury
   e. Epidural abscess/meningitis

8. Neuraxial opioids for obstetrics

9. Anesthesia for Cesarean delivery

10. Anesthesia for post-partum tubal ligation

11. Anesthetic considerations in preeclampsia and eclampsia *

12. Obesity/morbid obesity *

13. Diabetes mellitus *

14. Anesthesia for surgery during pregnancy

Advanced rotation:
For the advanced OB anesthesia rotation, it is expected that the resident will become familiar with all of the items listed for the advanced OB anesthesia curriculum in this manual. In order to effectively demonstrate their knowledge in this area, it is expected that each resident will give a brief presentation to the attending of the day covering at least 4 of the 16 items. The presentations may take the form of a review of a clinical case addressing the issues or a more didactic discussion at the discretion of the resident. The successful completion of this requirement will be documented by use of the sign-off sheet located at the end of the manual. This sheet must be returned to the OBA rotation director at the conclusion of the month.

Advanced Topics

1. Fetal & neonatal resuscitation
   Intrapartum fetal resuscitation
   Neonatal physiologic adaptations to extrauterine life
   Resuscitation of the newborn - NALS protocol

2. Non-regional labor analgesia
   Discuss options available for maternal comfort

3. Aspiration
   Describe methods for prevention of aspiration and for mitigation of consequences of aspiration
   Outline signs and symptoms of aspiration and a plan for the PACU and postoperative care of a patient who has aspirated

4. Neurologic complications of anesthesia
   Complications of regional anesthesia and their treatment: postdural puncture headache, maternal backache, maternal nerve palsy, epidural abscess or hematoma

5. Asthma and ARDS *

6. Cardiac disease *
   1. Understand when invasive monitors are needed for delivery and postpartum care
      a. Congenital Heart Disease
         1. left to right shunt
         2. right to left shunts (Tetralogy of Fallot)
         3. pulmonary hypertension (Eisenmenger’s syndrome)
         4. coarctation of aorta
      b. IHSS
      c. Ischemic heart disease
      d. Valvular heart disease
         1. aortic stenosis
2. aortic insufficiency
3. mitral stenosis
4. mitral regurgitation
e. Peripartum cardiomyopathy

2. Approach to CPR in a parturient, awareness of need for delivery of baby

7. Neurologic disease  *
   1. Multiple sclerosis
   2. Spinal cord injury
   3. Myasthenia gravis
   4. Seizure disorders
   5. Subarachnoid hemorrhage or vascular malformations

8. Musculoskeletal disease  *
   1. Scoliosis
   2. Rheumatoid arthritis
   3. Spina bifida cystica
   4. Prior back surgery including Harrington rod placement

9. Hematologic & coagulation disorders  *
   1. Anemias
   2. Coagulation disorders

10. Autoimmune disorders  *

11. Substance abuse  *
    1. Ethanol abuse
    2. Opioid abuse and barbiturate use
    3. Cocaine abuse

12. Renal disease  *

13. Liver disease  *

14. HIV *

15. Thyroid disease  *
    1. Hyperthyroidism
    2. Hypothyroidism

16. Ethical Issues
    1. Awareness of potential for maternal-fetal conflicts of interest (e.g. general anesthesia for emergency cesarean delivery in face of perceived fetal jeopardy)
    2. Respect for all moral and religious points of view (e.g., Jehovah’s Witness patient)
3. Awareness of fetal development and current limits of viability

**Operating Room Checkout**

The anesthesia machines in OR 13, 14, & 15 should be checked every morning in the usual manner. All three operating rooms have to be ready for a case at all times. In addition, the following items need to be checked in each OR:

The only drug that should be in the top drawer of the anesthesia cart:
- Cefazolin 2g in 20 ml prefilled syringe, taken daily from the refrigerator

Emergency drugs in the clear plastic box are maintained by Pharmacy:
- Propofol and/or etomidate
- Epinephrine
- Succinylcholine
- Ephedrine
- Phenylephrine
- Atropin
- Oxytocin

If you open the clear box in an emergency, please notify Pharmacy. They will refill the box and put a new lock.

All medications drawn up in syringes have to be labeled with date and time according to the departmental policy. All syringes that you fill must be discarded after 24 hours. Punctured sodium bicarbonate vials have to be discarded at the end of the case.

Jet ventilator is in working order and easily accessible.
Two 1 liter IVF pressure bags.
Emergency drugs are readily available.
Short laryngoscope handle.
MacIntosh and Miller blades.
LMA sizes 3, 4, and 5.
Supreme LMA sizes 3 and 4.
Two adjustable IV poles with clips are available.
There should be a enFlow IV fluid/blood warmer on one of the IV poles in every OR.
There should be an infusion pump in every OR.

The enFlow blood warmer in ORs 13 and 14 should have disposable tubing assembled consisting of 1000cc NS with air removed, blood transfusion Y set > enFlow disposable cartridge > 20”extension with needleless ports. Any time a hotline is hung and primed, it must be labeled with date and time because it has to be used within 24 hours. If you find it spiked and not labeled with date and time, please throw it away and prepare as above.
In OR 14 next to the door, there is an IV pole labeled “Arterial line”. Please make or bring an A-line every day, so it is available in case of emergency.

In OR 15 the setup is slightly different. There is no need to have cefazolin and the IV tubing with the enFlow cartridge does not have to be assembled. Emergency cases are rarely performed in this OR; in those rare cases, cefazolin can either be mixed or brought from another OR along with an IV pole with the assembled hotline. The Level 1 is kept in OR 14. You must learn how to set it up. The Level 1 is very rarely used and is expensive; if you need it, it can be set up quickly. There is an open practice set in the workroom.

**Postoperative Operating Room Set-up**

There are no regular anesthesia technicians assigned to L&D, so you are responsible for routine turnovers of your machine and equipment.

An anesthesia technician is required to come over at least once a day and restock the anesthesia carts and the epidural carts. If you need help with a major turnover on a busy day, the anesthesia technician assigned to OB can be contacted during the day either by calling Dominic Tanner, Anesthesia Manager, 453-6746, or the main OR desk.

If you need supplies, almost everything is available from the Pyxis in the storage room.

Before you leave the OR after a case, please hang every monitoring cable on the side arm display, so the OR floor can be cleaned.

After the patient’s care is handed over to the PACU nurse, you should return to the OR and set it up as described above and please wipe the cables off with CaviWipe.

You must be sure to replace any of the following items if they were used:
- laryngoscope blade
- suction canister and tubing
- breathing circuit
- hotline tubing

If Bicitra was taken in an emergency from a clear plastic box (located throughout the OR suit), you need to charge for it in the Pyxis and replace it.
Preanesthesia Evaluation

All patients (including those receiving labor epidural analgesia) require a preoperative evaluation complete with current vital signs and a focused physical exam. Pay attention to the obstetric section of the review of systems; please complete it.

Orders

All operative cases are considered inpatient. The Anesthesia PACU Order power plan has to be initiated (same as in the main OR). The Anesthesia Spinal Morphine Order power plan is planned at the same time (signed but not initiated). The spinal morphine order set allows you to order small doses of IV or PO opioids that can be administered on the floor without the risk of respiratory depression.

Important: Please check the communication order at the bottom; this way the nurse can discontinue the orders after 24 hours and fewer conflicting or co-existing orders will get canceled by the pharmacy. At the time of discharge from the PACU, a postoperative note is entered in Powerchart. When the patient gets transferred to the post-partum unit, the nurse will discontinue the PACU orders and initiate the spinal morphine orders.

A new order set titled Anesthesia L&D Labor Epidural should be completed for patients receiving epidural analgesia.

Please understand that the system is still new and imperfect; changes are frequently made. This manual tries to keep up with the changes but cannot reflect the most recent ones.

Postanesthesia Evaluation

Every patient who has received anesthesia care must be seen the next day, as early as possible, regardless of the procedure they had (vaginal delivery or C-section, or any surgical intervention). If you cannot make time for post-op visits, discuss this with your attending so he can help. As all operative patients have a postoperative note upon discharge from the PACU, it is most important to see those patients who had epidural labor analgesia. A postoperative note has to be entered in Powerchart. Prior to seeing the patient you should review the anesthesia record for type of anesthesia, procedure, and any noted anesthetic complications. Patients are located on the postpartum ward on the 3rd floor and in OB Special care on the 4th floor.

Each patient should be specifically evaluated for the following:

Regional Anesthesia:
Presence or absence of headache.
Presence or absence of persistent LE numbness or weakness. You should also document whether or not the patient is able to ambulate without difficulty.
Presence or absence of back pain. Most back pain is mild and transient and not necessarily related to regional anesthesia. It should resolve within several days with heat and NSAIDs.
For patients receiving neuraxial morphine you should ask about their post-op pain, nausea, vomiting, pruritus, and ability to urinate.

General Anesthesia:

Awareness
PONV
Sore throat
Etc.

If there is a complication, appropriate follow-up should be arranged in consultation with the attending. Complications that require further follow-up should also be noted on the dry erase board in the OBA office and turned over to the incoming resident.

Placing an Epidural

You should learn to perform an epidural in an organized and efficient manner. It often happens that there is more than one procedure to do at the same time, so you will need to learn to place an epidural and finish paperwork within 30 minutes (for most patients).
When appropriate you should have the nurse assist you to position the patient while you are performing a history and physical and at the same time setting up your epidural tray.

At the end of this section you will find information regarding the placement and management of labor epidurals. This information is adapted from Chapter 23 of Obstetric Anesthesia, Principles & Practice, Fourth Edition, by David H. Chestnut. Please refer to the textbook for further details.

There is a detailed patient education sheet that addresses the risks of labor epidurals and other anesthesia procedures “Pain during childbirth: What can we do about it?” It is included at the end of the Manual for your reference. A copy of this should be in every labor room and the nurses should give it to the patients soon after they arrive in the room.
On its second page the risks of labor epidurals are discussed in order of their frequency. You should be ready to answer questions related to this material.
The information that follows is specifically directed to the placement of labor epidurals here at the University of New Mexico. It is intentionally written in detail so as to shorten the amount of time it takes for you to become efficient at placing epidurals.

In order for the Department of Anesthesiology to be reimbursed for the placement of an epidural it is mandatory that an attending be present for at least part of the epidural placement. You should therefore page the attending prior to the placement of any epidural.

Take the epidural cart to the patient’s room.

Conduct a focused history and physical prior to the placement of an epidural. This should include medical history, anesthesia-related obstetric history, airway examination, vital signs, and pertinent labs. Explain the procedure and the risks of epidural analgesia prior to placing the epidural. Specific risks you should discuss are: risk of hypotension (which we closely monitor and treat if indicated), failure of the block requiring repeat placement (2-5%), post dural puncture headache (1-2%), neurologic complications and infection (extremely rare). List the patient’s medical / obstetric problems and the anesthetic plan. Document that the risks and benefits of the procedure were explained to the patient and that all questions were answered.

Since placing an epidural is a sterile procedure, it is mandatory that a cap and mask be worn. Handwashing and removal of any rings, watches, and bracelets has also become standard.

Palpate the patient’s back to locate the appropriate intervertebral space. Select the “best” interspace nearest to the interiliac crest line (Tuffier’s line). Interspaces L3-4 and L4-5 are the most appropriate for labor epidural analgesia. The spinal cord ends at the upper border of the L2 vertebra in the majority of patients. In a small minority of patients the spinal cord may extend to the lower border of the L3 vertebra. In case of accidental dural puncture with the Tuohy needle, there is increased risk of neurologic injury if you place it high. Keep in mind that Tuffier’s line does not consistently cross the L4-5 disc in all patients due to the exaggerated lumbar lordosis. Interspaces are narrower in the pregnant patient when compared to the non-pregnant patient. You should therefore pay special attention to the proper positioning of the patient prior to epidural placement so as to open the interspaces as much as possible.

In order to speed the clean-up after placement of the epidural, you should proceed in an orderly fashion while you are placing the epidural. As items from the epidural tray are used, they should be placed in one of three places. All non-sharp items that will not be used again should be placed in the empty epidural container. All other non-sharp items should be placed on the blue wrapper outside of the epidural tray. Sharp items should be placed back into the epidural tray.
The epidural space is located utilizing loss of resistance to air or normal saline. There are advantages and disadvantages with each method but the evidence favors LOR to saline in this setting.

You should develop a systematic approach to locating the epidural space. If your needle contacts bone ask the patient if they felt it on one side or another. The patients can always tell if the needle is significantly off the midline. If the patient feels the needle on the left, you should pull back the needle 1-2 cm and redirect to the right and slightly cranial. Always trust your patient’s feedback but make sure they don’t confuse left with right by touching the respective side and asking something like: “You mean this side?” If the patient does not perceive any laterality upon bone contact, “walking” the needle up in small increments is usually sufficient. As you do more epidurals and gain more experience, you develop a feel for where you are and what adjustments to make to enter the epidural space. This won’t happen if you proceed in a haphazard manner.

Once the epidural catheter has been placed, it should be positioned so that the multifor- channel catheter is 5 cm into the epidural space. For obese women it is best to lay the patient in the lateral position prior to taping the catheter in place. The catheter should be allowed to move inwards during this maneuver and then taped in place.

Always aspirate the catheter prior to injecting any medications. If the aspiration is positive for blood or cerebrospinal fluid, you should not administer the test dose. If the epidural catheter is intravascular, you may either 1) withdraw the catheter and flush with normal saline to clear the catheter of any blood and then reaspirate the catheter for blood, or 2) resite the epidural catheter. If the catheter is intrathecal, you may either 1) resite the catheter or 2) utilize the catheter to administer continuous spinal labor analgesia. We usually choose to administer continuous spinal analgesia. The anesthesia attending should be notified if any of the above problems occur.

Intrathecal catheters should be clearly marked, a sign placed on the patient’s door, the pump has to be labeled “intrathecal” and the “Labor epidural” powerorder completed accordingly, checking the appropriate box. The patient, the nurse, the OBA attending and the 3rd year OB resident should be notified so as to avoid the intrathecal injection of an epidural dose of local anesthetic. If you plan to leave the catheter in place for 12-24 hours after delivery the L&D nurse should be instructed to leave the catheter in place with the filter attached. You need to make sure it is securely taped and covered with Tegaderm to prevent accidental administration of any drug on the floor.

If aspiration of the epidural catheter is negative, then a test dose should be given. The usual test dose is 3 ml of 1.5% lidocaine with epinephrine 1:200,000. This is a total of 45 mg of lidocaine and 15 mcg of epinephrine. The test dose is given to rule out intrathecal or intravascular placement of the epidural catheter. It does not confirm that the catheter is in the epidural space. Please be aware of the possibility of a false negative result.

After a test dose is given, you should monitor the patient for changes in heart rate for at least one minute. Be sure that a pulse oximeter or EKG monitor is in place prior to giv-
The timing of the test dose is very important. Uterine contractions frequently cause the heart rate to increase. This may confuse the results of the test dose if it is given close to the beginning of a uterine contraction. The lack of an increase in the heart rate only rules out the placement of an intravascular catheter.

To rule out the intrathecal placement of the catheter, you should wait at least 3 minutes prior to evaluating for motor block. After giving the test dose, tape the catheter in place and lay the patient supine with left uterine displacement. By the time the patient is supine 3 minutes should have elapsed and you can then evaluate the patient for lower extremity motor block. Do not begin incremental dosing of the epidural catheter until intrathecal injection has been specifically ruled out. High blocks are the main cause of labor epidural related mortality.

When you finish placing the epidural catheter, you simply lift the epidural tray filled with sharps, roll up the blue wrapper, place it in the epidural container, and throw everything in the trash. All that is left is the epidural tray with the sharps which can then be emptied at your leisure. Cleanup is quick and easy and you are ready to proceed to dosing the epidural and completing the paperwork.

The epidural should be dosed with 0.125% bupivacaine. Ten ml of 0.25% bupivacaine are drawn up with an additional 10 ml of normal saline in the 20 ml syringe supplied in the tray. A total of 10-15 ml will provide satisfactory analgesia in most cases. Bupivacaine 0.25% may be needed if more dilute solutions have failed to provide satisfactory analgesia especially in late first stage (perineum innervated by S2-4).

After intrathecal catheter placement has also been ruled out, you can start incrementally dosing the epidural catheter. Incremental dosing is very important; false negative test dose is possible! Three to five ml of local anesthetic is given every 3 minutes. Prior to each bolus injection you should 1) always aspirate the catheter, 2) evaluate the patient for development of significant motor block, 3) check the blood pressure. If hypotension develops, stop, and administer a fluid bolus. Wait for the BP to return to baseline before continuing. Rarely you may need to administer phenylephrine IV.

Once you begin dosing the epidural catheter and every time you give a bolus, you are responsible for checking vital signs for at least 15 minutes. The current nursing protocol is to check the blood pressure every 5 minutes for 15 minutes. You should also continuously monitor the fetal heart rate for evidence of decreased uteroplacental perfusion.

As you are dosing the epidural you should be completing the anesthesia record and setting up the epidural infusion pump. The anesthetic record is completed as described in the section titled “Anesthesia Record” and the epidural pump is set up as described in the section “Epidural Pumps”. By the time the epidural is dosed and the patient is comfortable, you should have all your paperwork completed.
KEY POINTS

- Epidural analgesia is the most effective form of intrapartum analgesia currently available. In most cases, maternal request for pain relief represents a sufficient indication for the administration of epidural analgesia.
- The safe administration of epidural analgesia requires a thorough (albeit directed) preanesthetic evaluation and the immediate availability of appropriate resuscitation equipment.
- Administration of the test dose should allow the anesthesiologist to recognize most cases of unintentional subarachnoid or intravascular placement of the epidural catheter. All therapeutic doses of local anesthetic should be administered incrementally.

Bupivacaine is the local anesthetic most often used for epidural analgesia during labor. Ropivacaine is a satisfactory (albeit more expensive) alternative. Most anesthesiologists reserve 2-chloroprocaine and lidocaine for cases that require rapid extension of anesthesia for vaginal or cesarean delivery.
- The most common complication is hypotension. Prophylaxis and treatment include avoidance of aortocaval compression, intravenous hydration, and administration of ephedrine or phenylephrine as needed.

CONTRAINDICATIONS TO EPIDURAL AND SPINAL ANALGESIA

- Patient refusal or inability to cooperate
- Increased intracranial pressure secondary to a mass lesion
- Skin or soft tissue infection at the site of needle placement
- Frank coagulopathy
- Uncorrected maternal hypovolemia (e.g., hemorrhage)
- Inadequate training in or experience with the technique

ASSESSMENT OF MOTOR BLOCK

1. Complete – unable to move feet or knees
2. Almost complete – able to move feet only
3. Partial – just able to move knees
4. None – full flexion of knees and feet

(Several versions of this “Bromage score” exist.)

ADMINISTRATION OF EPIDURAL ANALGESIA FOR LABOR: A TECHNIQUE

1. Informed consent is obtained and the obstetrician is consulted.
2. Monitoring includes the following:
   - Blood pressure every 1 to 2 minutes for 15 minutes after giving a bolus of local anesthetic
   - Continuous maternal heart rate monitoring during induction of anesthesia
   - Continuous fetal heart rate monitoring
   - Continual verbal communication.
3. The patient is hydrated with 500 mL of Ringer’s lactate solution while the patient assumes the sitting or lateral decubitus position.
4. Sterile technique maintained.
5. The epidural space is identified using loss of resistance technique.
6. The epidural catheter is threaded approximately 5 cm into the epidural space.
7. A test dose of 3 mL of 1.5% lidocaine with 1:200,000 epinephrine or 3 mL of 0.25% bupivacaine with 1:200,000 epinephrine is injected after careful aspiration and after a uterine contraction (to minimize the chance of confusing tachycardia that results from pain with tachycardia secondary to intravenous injection of the test dose).

PREPARATION FOR NEURAXIAL LABOR ANALGESIA

1. The patient requests epidural analgesia for pain relief (or for relief of anticipated pain, as in planned induction).
2. The obstetrician is consulted to confirm that:
   a. The patient is in labor and the obstetrician is committed to delivering the infant.
   b. All relevant obstetric issues are understood (e.g., gestational age, intrauterine growth restriction, fetal presentation, risk of obstetric hemorrhage, previous cesarean delivery).
3. A focused preanesthetic evaluation is performed, which includes an assessment of the patient’s medical and anesthetic history, pertinent labs.
4. The risks of epidural analgesia are discussed with the patient, and informed consent is obtained.
5. An assessment of fetal wellbeing is performed in consultation with the obstetrician.
6. Check routine equipment and emergency equipment.
7. Confirm adequate IV access.
MANAGING AN INADEQUATE EPIDURAL BLOCK

1. Perform an honest evaluation of the anesthetic:
   - Is the catheter really in the epidural space?
   - If in doubt, replace the catheter.
2. If the catheter is in the epidural space but the block is asymmetric:
   - Withdraw the catheter 0.5 to 1.0 cm, place the less-blocked side in the dependent position, and increase the volume (and decrease the concentration) of local anesthetic
   - If these maneuvers are unsuccessful, replace catheter.
3. If the catheter is in the epidural space but the patient feels pain because of a change in the nature of labor:
   - Ask the obstetrician to evaluate the progress of labor.
   - Check the bladder distention.
   - Increase the volume and/or concentration of local anesthetic, or add an opioid to the solution of local anesthetic.
   - Do not use an opioid to cover up a misplaced catheter.

MANAGEMENT OF UNINTENTIONAL INTRAVENOUS INJECTION

- Be aware that hypoxemia and acidosis develop rapidly during convulsions. Stop convulsions with a benzodiazepine (propofol acceptable if no CV instability).
- Use positive-pressure ventilation to prevent respiratory acidosis. Administer 100% oxygen to maintain maternal oxygenation. Tracheal intubation will facilitate ventilation and help protect the airway, but the administration of oxygen before intubation should not be delayed.
- Monitor maternal blood pressure and ECG, and FHR.
- Support blood pressure with intravenous fluids and vasopressors.
- Initiate ACLS in case of cardiac arrest. Start intralipid 1.5 ml/kg IV bolus, followed by infusion. Delivery of the fetus may facilitate successful resuscitation of the mother.
- Epinephrine may potentiate LA-induced arrhythmia, decrease dose. Vasopressin is no longer recommended.
- For arrhythmia, amiodarone is the first-line agent.

MANAGEMENT OF TOTAL SPINAL ANESTHESIA

- High spinal anesthesia may occur several minutes after an epidural injection of local anesthetic. Communicate with the patient. Agitation, dyspnea, and difficulty speaking may herald the onset of total spinal anesthesia.
- Avoid aortocaval compression.
- Administer 100% oxygen to the mother.
- Provide positive-pressure ventilation, preferably through an endotracheal tube.
- Monitor maternal blood pressure, ECG, and FHR.
- Support maternal circulation with intravenous fluids and ephedrine as needed. Do not hesitate to give epinephrine if needed.

CLINICAL FEATURES OF EPIDURAL, SUBDURAL, AND SPINAL BLOCKS

<table>
<thead>
<tr>
<th></th>
<th>Epidural block</th>
<th>Subdural block</th>
<th>Spinal</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONSET TIME</td>
<td>Slow</td>
<td>Intermediate</td>
<td>Rapid</td>
</tr>
<tr>
<td>SPREAD</td>
<td>As expected</td>
<td>Higher than</td>
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<td>Expected: may</td>
<td>than expected:</td>
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<td>cranially, but</td>
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<td></td>
<td>sacral sparing</td>
<td>sacral block</td>
<td>sacral block</td>
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<td></td>
<td>is common</td>
<td>typically is</td>
<td></td>
</tr>
<tr>
<td>NATURE OF BLOCK</td>
<td>Segmental</td>
<td>Patchy</td>
<td>Dense</td>
</tr>
<tr>
<td>MOTOR BLOCK</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Dense</td>
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<tr>
<td>HYPOTENSION</td>
<td>Less than</td>
<td>Intermediate</td>
<td>Likely</td>
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Table 21-4 Clinical features of epidural, subdural, and spinal blocks
Anesthesia Record for Labor Epidurals

The American Society of Anesthesiologists has published guidelines regarding the administration of regional anesthesia or analgesia to the parturient during labor & delivery. These guidelines are intended to encourage quality patient care. ASA guidelines also state that accurate documentation should accompany all anesthetics. Accurate documentation also facilitates the billing and reimbursement for our anesthesia services.

The electronic anesthesia record for labor epidurals is somewhat different from the surgical cases:

a) Open Cerner Anesthesia application. Choose “UH Anes Mobiles”. Select your patient.
b) Macro: click OB, select Labor Epidural (single macro, no “all case”)
c) For epidurals the anesthesia start time is the start of the epidural placement process (patient positioning for epidural). Time spent to evaluate the patient should not be included.
d) Verify type of anesthesia: epidural primary (not pain!)
e) Manually insert vital signs.
f) End time is when the procedure is completed and you leave the room. Stop personnel and fluids and epidural infusion at the same time.
g) To document a rebolus, unfinalize the record and document in the usual way. Do not document ongoing infusions; the nurses document that.
h) If a patient with a labor epidural is taken to the OR for surgery (C-section, placental extraction, etc.) you have to open a new anesthesia record.
i) Maternal vital signs at least q 5 minutes while dosing epidural; can be more frequent.
j) Fetal heart rate q 5-15 minutes while dosing epidural or evaluating patient. Document abnormal FHR.
k) Level of anesthesia and cervical dilation. Cervical dilation at the time of request is documented on the preop note. The most recent cervical dilation should be documented.
l) Drugs given incrementally should be documented in that manner. If a total of 15 ml of 0.125% bupivacaine was given in 5 ml increments then it should be documented “5/5/5” and not as “15”.
m) Accurately document the IVF bolus given during epidural or spinal placement. Attending signatures. The department will not be reimbursed for epidurals or spinals placed if the attending was not present during their placement.
Epidural Pumps & Cassettes

The epidural infusion cassettes are in the Pyxis MedStation in the workroom.

The epidural pumps need 4 AA batteries. If the batteries are depleted, the pump will not function even if the AC power supply is connected. Batteries can be obtained from the L&D desk.

Also make sure that there are sufficient amounts of pump tubing stocked in the epidural carts. Notify the anesthesia technicians if these need to be restocked or restocked from the Pyxis.

Setting up the epidural pump

There are 12 numbered pumps, complete with AC adaptor, one in each labor room. They should stay in the room, plugged in at all times.

The new pumps are very easy to use. The current drug library consists of only one medication, our standard epidural infusion (bupivacaine 0.1% with fentanyl 2mcg/ml). As the solution contains fentanyl, the cassette and the pump has to be locked when in use.

The code for the pump is “123”.

Billing & Compliance

There are several different methods to bill for obstetric anesthesia services. The Relative Value Guide put out by the ASA explains the different methods.

For a labor epidural the UNM Department of Anesthesiology is currently billing 5 base units + 2 units per hour until delivery for most insurance companies. With some insurances we have to document face-to-face time and we bill partially based on this. So it is important that you document vitals for the whole duration of epidural placement, usually 30 minutes (2 units) even if there is a gap, when after the initial baseline values you are not obtaining further measurements until the epidural test dose. If you rebolus an epidural, unfinalize the record and record at least 3 sets of vital signs covering a 15 minute period.

In this manner, it will be much easier for the billing office to total the actual time spent with the patient. When a labor epidural is placed, the start time should be when the patient is positioned for placement of the epidural. Please note that you should record the “exact” start and stop times and not times that have been rounded off to the nearest 5 minutes. Too many times ending in 5 and 0 trigger audits.

If a patient undergoes neuraxial analgesia for labor ending in vaginal delivery, then the “anesthesia end time” will be the time of delivery. If your presence was required for the delivery, for example for a rebolus or for a minor repair, then the times should be recorded for start of presence and end of presence as a “rebolus”. If the patient needs a more definitive operative procedure in the operating room, open a new record after the patient had been scheduled in Surginet. Use the “OB epidural rebolus” icon and indicate “conversion to surgical anesthesia”.

A patient may have a labor epidural for vaginal delivery, have the epidural catheter removed, and the following day undergo PPTL under spinal anesthesia. In this case, a new electronic anesthesia record would be completed and the patient billed for two totally separate procedures.

When multiple events occur requiring separate anesthesia records, a new preoperative evaluation needs to be performed on the patient. The previous preoperative note can be “copied” to a new note but it has to be updated with the new diagnosis/procedure, vital signs, physical exam, labs, etc.

In order to be able to bill for our services, the anesthesia attending must be present for the delivery of all anesthetics on L&D. You should always page your attending before plac-
ing an epidural or delivering any type of anesthesia in the OR. Unless the attending has signed the record stating that he/she was present we may not be able to bill for our services.
Airway Cart and GlideScope

An airway cart and a GlideScope are available to use in the event of a difficult airway. The incidence of failed intubation in the obstetric population is approximately 1:300 as compared to 1:2300 in the general population. Difficulty in managing the airway is one of the main causes of anesthesia related mortality in the obstetric population. The airway cart should therefore be ready to use at a moment’s notice and you should have a well thought out plan of what to do in the case of a difficult airway or failed intubation.

The Airway cart should be specifically checked for the presence of the following items:

Fiberoptic bronchoscope and light source

An extra set of laryngoscope handle with blades

Small tools:
- MADgic laryngo-tracheal atomizers
- Cotton tipped applicators
- Tongue blades
- Swivel connectors

Airways:
- Oral airways & Williams airway intubators (size 7, 8, & 9)
- Nasal trumpets – 6.5, 7.0, 7.5, 8.0 (do not use in pregnant women except in special circumstances, with approval from your attending – high risk of bleeding due to friable nasal mucosa!)

Drugs:
- 4% lidocaine topical solution
- 2% viscous lidocaine
- Cetacaine spray
- Defogger

Bullard laryngoscope with working handle and spare plastic blade extenders

LMA #3, #4, #5, ProSeal LMA #3, #4, #5, Supreme LMA #3 and #4
LMA-Fastrach #3, #4, #5 with matching ETT and stabilizing rod (“pusher”)

Cricothyrotomy kit

Endotracheal tubes

Both the airway cart and the GlideScope are kept in OR 14.
Epidural Cart

There are two epidural carts on the labor & delivery deck. These should be kept in the anesthesia workroom. The Joint Commission requires us to lock the carts whenever unauthorized persons have access to them. Over the years we have received citations repeatedly because the carts were left unlocked in the hallways. It is not worth risking UNMH’s accreditation. Please take the cart into the patient’s room when you place an epidural, then return it to the workroom.

Each drawer of the carts should be checked every morning to ensure all items necessary for epidural placement are readily available. The carts should be kept neat and organized. There should not be any supplies left on top of the cart when it is not in use except the alcohol hand cleanser. The code for opening the carts is “145”.

The anesthesia techs should be notified if any items need to be restocked. If necessary you can restock the carts from the supplies found in the Pyxis. The Pyxis is restocked by CDU on a daily basis.

You should specifically ensure that all emergency supplies are present and in working order. These items can be found in the top drawer. Check the expiration dates on the emergency syringes. Emergency drugs, laryngoscopes, & endotracheal tubes should all be available and ready to use.

As drugs are used they should be replaced as soon as possible, and you should not start placing or dosing an epidural without airway equipment and emergency drugs at hand.

The Pyxis MedStation 3500 System

How to Obtain Access:

All anesthesia providers should have access to all MedStations in our three areas. There are two machines on Labor and Delivery: one in the anesthesia work room, and one in PACU (for refrigerated drugs). The Pharmacy provides training and assigns the initial password. The system requires the use of BioID (fingerprint). Residents receive their training during the July orientation.

How to remove a medication:

From the Main Menu, touch REMOVE. Select a patient, or, if removing medications to stock the carts, select AAA OB Anesthesia, then select the medication. Follow the instructions on the screen.
There have been several changes since the first implementation. Currently, we have access to the Pyxis in the PACU because this machine contains a refrigerator. Medications that need to be refrigerated are kept here: cefazolin, methylergonovine (Methergine), carboprost (Hemabate), insulin, cisatracurium, and 3 liters of NS for MH protocol. Cefazolin has to be charged to the patient in the OR anesthesia pyxis when we use it. Go to “select meds”, type “cefazolin”. You will see the 1 gm vials and the 2g/20 ml syringes, which are in a “virtual drawer”, the refrigerator. Click on the syringe.

How to return a medication:

Touch on the RETURN tab on the screen. Touch on the patient’s name and select the medication. Follow the instructions on the screen.

How to resolve a discrepancy:

At the bottom right hand side of the log-in screen it will show you in red if there are any unresolved narcotic discrepancies.

If you create a discrepancy, you need to resolve it:

Log in, then touch the DOCUMENT DISCREPANCY tab. There will be a list of the current discrepancies.

Touch the entry you want to resolve.

Have a witness log in.

Select a reason for the discrepancy or press OTHER and type the reason, then press ACCEPT.

For more detail and other functions, see the Quick Reference Guide placed on every Pyxis machine.

Please pay attention to dialog boxes that warn you about a discrepancy being generated. Discrepancies must be resolved on the same day. In the past the outgoing resident created around 90% of the discrepancies, so if you find a discrepancy during handover, the person who created it will likely be present, and remember what happened.

If you have difficulties or a pocket is empty, call the main pharmacy (22033) for help.
Research

One of the missions of the University of New Mexico and the Department of Anesthesiology is to participate in research. In Obstetric Anesthesia we will be conducting research studies on a regular basis. Each study will have a notebook with all the pertinent information with regards to the study. The study notebook can be found on the shelf in the OBA office.

As a part of your obstetric anesthesia rotation you will be expected to be familiar with the protocols, recruit patients, and collect data for these ongoing studies. You should have read through the protocols and know what the inclusion criteria are and what data needs to be collected. Please discuss with the investigators regarding how the study is being conducted and what you should do with regards to recruitment and data collection. If you are interested in working with an OBA attending to develop a study please notify the Director of Obstetric Anesthesia.

Many clinical studies in Obstetric Anesthesia can be completed in less than a year. It is possible for you to present abstracts of ongoing research at the Western Anesthesia Residents Conference and the annual meetings of the Society for Obstetric Anesthesia & Perinatology (SOAP), the American Society of Regional Anesthesia (ASRA), the International Anesthesia Research Society (IARS), and the ASA. It is also possible to have a paper accepted for publication in one of the major anesthesiology journals.

Again, if you are interested in working with an OBA attending to develop a study please notify the Director of Obstetric Anesthesia.
Obstetric Anesthesia Pagers

There are two special pagers that are assigned to the Obstetric Anesthesia team. One is carried by the resident, one by the attending covering OB. Each pager can be activated individually or simultaneously. They are activated simultaneously in emergency situations when the attending & resident need to respond immediately (and hopefully, in the future, a technician will be available to assist). In this case “22603-911” should appear on your pager and you MUST proceed to the obstetric ORs immediately. If there is no patient in the OR, go to the front desk to find out where you are needed. It may be an emergency in triage or a labor room.

It is your responsibility to ensure that the resident pager is passed on to the person relieving you from your responsibilities on OB and not left on a desk or clipped to a mailbox. When you are assigned to OB, you should be sure to have the resident OB pager and that your name and pager number is marked on the board in the Obstetricians’ work room.

Resident 951-1376
Attending pager 951-1375
Emergency group# (pages both pagers) 951-9931

The advantage of using the 951-9931 emergency number is that:

1. It is a “prioritized” number; meaning that once the page is sent, it does not get queued, causing delays of up to 8 minutes in broadcasting the page depending on pager traffic at that moment. This number goes to the front of the queue and is broadcasted within 20 seconds.

2. By entering one number 2 individuals are notified freeing up the secretary for other tasks.
Anesthesia Office

Computer

The computer in the Obstetric Anesthesia office is for the use of all anesthesia providers working in OB. Please do not download or add any programs onto this computer. All unauthorized programs / files will be purged periodically. To keep your data from being erased, store them in your personal folder on network drive: "H" assigned to you by UNM. To access this folder login to Novell under your username, go to My Computer, under Network Drives click “Data on 'Hsc-ace' “ and open the HOME folder.

Dry Erase Board

The purpose of this board is to help with the transfer of information among the anesthesia care team. It is located in the Obstetric Anesthesia Workroom.

The following information should be recorded on the board:
- Any anesthetic complications that require continued follow up. (ie., PDPH, prolonged block, etc.)
- All complicated patients who may require anesthetic care whether or not they have an epidural in place.
- All patients who may be at increased risk for urgent or emergent cesarean section.

The board should be updated on a regular basis. The board in the Obstetrics workroom should also be checked on a regular basis and changes made to our dry erase board as needed.

The board should again be specifically updated at the time you turn over obstetric anesthesia responsibilities to the oncoming resident.

Anesthesia Storage Room (room 4109 in the OR suite)

You will find the hemorrhage/MH cart, blood refrigerator and the Pyxis SupplyStation here. The Pyxis is stocked on a regular basis by CDU. Any anesthesia equipment or materials that are out of stock in the ORs or epidural carts can be found in the Pyxis.

You have to have access to the Pyxis. Discuss this with the Director of Obstetric Anesthesia prior to beginning your rotation.

The hemorrhage/MH cart has supplies needed for massive transfusion and treatment of MH. This cart is not intended for elective central line placements. Anytime you are using the hemorrhage cart, ask yourself if you should activate the massive transfusion protocol (see MTP section in this manual) If the protocol is activated make sure the pathology resident on call was also notified. (pager 951-1055)
The contents of drawers 1 and 9 should be left untouched (MH supplies only). Pharmacy maintains them. Most of the MH supplies listed here

http://www.mhaus.org/mhaus-faqs-healthcare-professionals/stocking-mh-cart/

are in the cart.

The contents are the following:

<table>
<thead>
<tr>
<th>Drawer 1. (adjuvant MH drugs only)</th>
<th>Test tubes for labs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>D50 50 ml x 2</td>
<td>- purple top x 2</td>
</tr>
<tr>
<td>Lidocaine 2% 5 ml x 3</td>
<td>- blue top x 2</td>
</tr>
<tr>
<td>CaCl 1 g x 2</td>
<td>- green top x 2</td>
</tr>
<tr>
<td>Furosemide 40 mg x 4</td>
<td>Tegaderms large and small</td>
</tr>
<tr>
<td>Bicarbonate 50 ml x 5</td>
<td></td>
</tr>
<tr>
<td>ABG kit x 6</td>
<td></td>
</tr>
<tr>
<td>Test tubes for labs:</td>
<td></td>
</tr>
<tr>
<td>- green top x 2</td>
<td></td>
</tr>
<tr>
<td>- blue top x 2</td>
<td></td>
</tr>
<tr>
<td>- purple top x 2</td>
<td></td>
</tr>
<tr>
<td>Urine sample cup</td>
<td></td>
</tr>
</tbody>
</table>

| Drawer 2                                        |                      |
| Epinephrine 1 mg Abboject x 10                  |                      |
| CaCl 1 g Abboject x 10                         |                      |
| Atropine 1 mg x 2                              |                      |
| Bicarbonate 50 ml x 2                          |                      |

| Drawer 3 Bicarbonate, THAM                     |                      |
| Drawer 4                                       |                      |
| Blunt fill needles                             |                      |
| Syringes 10 cc, 20 cc                          |                      |

| Drawer 5                                       |                      |
| Angiocath 14 G 2” x 10                         |                      |
| Angiocath 16 G 2” x 10                         |                      |
| Angiocath 18 G 1” x 10                         |                      |
| Angiocath 20 G 1” x 10                         |                      |
| Stopcock x 8                                   |                      |
| Tourniquet x 5                                 |                      |
| 1” tape x 2                                    |                      |
| ABG kit x 6                                    |                      |
| Arrow 20G needle x 8                            |                      |
| Pressure tube extension short x 1              |                      |
| Pressure tube extension long x 1               |                      |
| Wrist support x 1                               |                      |

| Drawer 6                                       |                      |
| Blood filter (Pall) x 8                        |                      |
| Pressure bag x 3                               |                      |
| Y-set x 4                                      |                      |

| Drawer 7                                       |                      |
| Hotline tubing x 2                             |                      |
| Level 1 tubing x 1                             |                      |
| Horizon tubing x 2                             |                      |
| Extension x 4                                  |                      |
| Minidrip x 2 (MH requirement)                  |                      |

| Drawer 8                                       |                      |
| 9 Fr MAC kit x 2                               |                      |
| 8 Fr double lumen x 2                          |                      |
| 7 Fr RIC x 4                                   |                      |
| Pressure transducer x 3                        |                      |
| Transducer holder x 1                          |                      |
| Chloraprep x 5                                 |                      |
| Sterile 4x4 2 boxes                            |                      |

| Drawer 9 (MH supplies)                         |                      |
| Dantrolene 30 vials                            |                      |
| Sterile water for dilution 2 x 1000 ml         |                      |
| 60 cc syringe x 5                              |                      |
| Mini Spike x 4                                 |                      |
| NGT x 2                                       |                      |
| Catheter tip 60 cc syringe x 2                 |                      |
| Plastic bags for ice                           |                      |
CRISIS MANAGEMENT TOPICS

Total Spinal – High Spinal Anesthesia

Definition
Total spinal anesthesia is the production of excessive cephalad spread of local anesthetics in the CSF.

Etiology
Excessive dose of local anesthetic injected into the subarachnoid or subdural space during spinal or epidural anesthesia/analgesia
Migration of an epidural catheter into the subarachnoid space, with subsequent subarachnoid injection of local anesthetic
Subdural (epi-arachnoid) placement of catheter
Subdural injection of local anesthetic:
   - Excess spread for the amount of local anesthetic given
   - Delayed onset
   - Patchy block
   - Relatively mild motor block

Typical Situations
Parturients who have a lower requirement for local anesthetic for neuraxial blockade
Difficult epidural needle or catheter placement
Unrecognized dural puncture
After routine “test dose”
Spinal anesthesia after failed epidural

Prevention
Use the appropriate dose of local anesthetic
Administer a test dose of local anesthetic prior to administration of additional local anesthetic via epidural catheter.
   - The test dose should be capable of producing detectable but not excessive level of spinal anesthesia. Wait 3-5 minute before concluding test dose is negative.
   - 3 ml lidocaine 1.5% with epinephrine
Use dilute local anesthetic solutions
Monitor parturients carefully during neuraxial blockade
Treat every bolus as a test dose

Manifestations
Symptoms may develop very rapidly after inadvertent subarachnoid injection of a large volume of local anesthetic, less rapidly for a subdural injection
Sensory block
Motor block
Agitation
Shortness of breath
Unable to grasp your fingers with her hand
Whisper then unable to speak
Loss of protective airway reflexes
Hypotension
Bradycardia
Nausea and vomiting
Loss of consciousness, unresponsiveness
Respiratory arrest
Cardiac arrest

Similar Events
Hypotension from other causes
Seizures
Local anesthetic overdose
Vasovagal episode
Medication error

Management
Resuscitation equipment and medications should be immediately at hand at all sites where neuraxial blockade is performed

Call for help
ABC’s done simultaneously / concurrently
Ventilate with 100% oxygen via bag mask if indicated
Apply cricoid pressure immediately
Beware risk of aspiration

Maintain left uterine displacement
Monitor BP, EKG, SpO2

Maintain verbal communication with mother
Perform endotracheal intubation if indicated
Low dose induction agent if has not lost consciousness.
Beware hypotension
Succinylcholine 1-1.5 mg/kg IV
Maintain intubation until 5 second head lift, good hand grip, & hemodynamically stable

Treat hypotension aggressively
IV fluid bolus
Vasopressors – ephedrine, phenylephrine
Treat bradycardia with atropine 0.5-2 mg IV and/or ephedrine
If hypotension does not respond rapidly to these measures, administer epinephrine 10-100 mcg IV
Hypotension can be profound and difficult to treat

If cardiac arrest occurs
Commence CPR immediately
If fetus is viable and immediate resuscitative efforts are not successful, cesarean section should be performed quickly

To maximize the chances of maternal and fetal survival, this decision should be made within 5 minutes of the arrest.
The mother is easier to resuscitate after delivery of the neonate because aortocaval compression is relieved.

**When is spinal too high?**
Treat with reassurance if only:
- Anxious
- Short of breath
- Weak hand grip
Treat with ETT if:
- SpO2 < 95% on 100% O2 via face mask
- Whispering but no longer able to phonate, unable to protect airway

Beware sudden cardiac arrest in normal healthy parturient after neuraxial block (may occur in hypovolemic patient after intrathecal meds)
- Severe bradycardia progressing to asystole
- Ephedrine, atropine
- Use epinephrine early if rapid onset bradycardia after neuraxial block

**Complications**
- Aspiration of gastric contents
- Cerebral or myocardial ischemia or injury

**PEARLS:**
- Check sensory levels early (first 2 min) and often (q 1-2 min)
- Elevate head of OR table
- If in doubt about preexisting block: use CSE or Epidural technique instead of Spinal
- Pay attention to Trendelenburg position due to very large buttocks on flat table
- Watch carefully those patients who have a severe cough. This could result in a high block.
- The advantages of regional anesthesia include
  - (1) an awake mother who can protect her airway,
  - (2) lack of a need for airway manipulation, and
  - (3) decreased incidence of acid aspiration
- The use of regional anesthesia in patients with a recognized difficult airway does not solve the problem of the difficult airway. In spite of the use of regional anesthesia, anesthesiologists should be prepared to deal with the airway if the need arises.

Potential problems with the use of regional anesthesia in the setting of a difficult airway:
- If regional anesthesia fails and general anesthesia is induced or if there is a total spinal in a patient with difficult airway, loss of consciousness is associated with the loss of muscle tone, which tends to cause these structures to collapse toward one another (e.g. tongue moves posteriorly) and results in distorted anatomy.
- The larynx moves to a more anterior position with the induction of anesthesia and paralysis, which makes conventional intubation more difficult.
- Posterior movement of the tongue and epiglottis can obstruct the airway. In unconscious individuals, reduction of the caliber of the pharyngeal lumen makes fiberoptic visualization more difficult.
- After failed use of regional anesthesia, induction of general anesthesia in the presence of a suspected difficult intubation may be followed by airway compromise and difficult mask ventilation, resulting in endangerment of patient safety with medicolegal implications.

If regional anesthesia is administered to a patient with difficult airway, close monitoring, an experienced anesthesiologist, and equipment should be immediately available to manage the airway. Inability to secure the airway and ventilate and oxygenate the patient can result in hypoxia and brain damage.

**Emergency Cesarean Delivery**

**Definition**
Emergency cesarean delivery is the immediate or urgent operative delivery of the fetus through an abdominal incision (laparotomy+ hysterotomy).

**Etiology**
Fetal or maternal emergency that in the opinion of the obstetrician requires an immediate or urgent cesarean section.

**Typical Situations**
Immediate:
- Nonreassuring fetal status
- Prolapsed umbilical cord
- Massive hemorrhage
- Uterine rupture

Urgent, but not immediate, surgery:
- Pre-eclampsia or eclampsia
- Malpresentation in labor
- Failure to progress in labor
- Mild fetal distress
- Chorioamnionitis
- Failed induction or trial of labor
- Repeat C/S with unfavorable scar
- Failed forceps delivery

**Prevention**
Identify high risk parturients
Adequate labor analgesia
Correct coagulopathy if applicable
Treat nonreassuring fetal status:
  - Optimize volume status
  - Maintain left uterine displacement
  - Treat hypotension
  - Supplemental oxygen
  - Discontinue oxytocin
  - Pharmacologic uterine relaxation

**Management**
If an immediate cesarean section is required, general anesthesia is the most suitable anesthetic technique

**GA:**
**Pre-induction:**
- Call for help
- Administer sodium citrate PO
- Maintain LUD
- Preoxygenate with 100% O2
- Check fetal heart tones

**Induction:**
- Cricoid pressure until ETT position confirmed to be in trachea
- RSI with: STP, Propofol, Ketamine or Etomidate
- Succinylcholine 1-2 mg/kg IV
- Intubate as rapidly as possible, confirm position
- Allow obstetrician to begin

**Maintenance:**
- 50% O2, 50% nitrous, low dose volatile anesthetic
- Short or intermediate duration muscle relaxant (or succinylcholine drip)

**After delivery:**
- Oxytocin 20-40 units IV infusion
- 30% O2/70% nitrous
- Discontinue (or decrease) volatile agent
- IV narcotics for analgesia

**After completion:**
- Reverse NMBA
- Suction oropharynx
- Extubate pt after return of laryngeal reflexes, muscle strength, consciousness

**IN PATIENT WITH WORKING EPIDURAL STABLE ENOUGH FOR CONTINUED REGIONAL TECHNIQUE:**
Increase IV infusion rate to infuse 1.5-2 L crystalloid
Administer local anesthetic via epidural catheter:
- 3% 2-Chloroprocaine or 2% Lidocaine with 1:200,000 Epi and NaHCO3 (1 mL of 8.4% per 10 mL lidocaine)
- Administer incrementally (5 mLs at a time)
- Check fetal heart tones
15-20 mLs of local anesthetic should achieve surgical anesthesia. Check level of block. If level inadequate by time of incision induce GA.
- Treat hypotension with rapid IVF infusion and ephedrine (5-10 mg) or phenylephrine (50-100 mcg)

PATIENT FOR URGENT BUT NON-EMERGENT CESARIAN:
Regional is commonly chosen
Prior to establishing block:
- Infuse 1.5-2 L bolus
- Bicitra 30 mL PO
- Metoclopramide 10 mg IV
- O2 via NC
- Left uterine displacement
- Monitors

Spinal:
- Standard SAB placement, 12 mg bupivacaine, treat hypotension, goal of a T4 level

Epidural:
- If not already in place, insert epidural in standard fashion
- Test dose
- Check level before administering full local anesthetic dose
- 2% Lidocaine with 1:200,000 epi and bicarbonate (as above), 15-25 mL is adequate in most pts
- Convert to GA if anesthesia not adequate by time of incision or fetal distress is present.

Complications
- Difficult intubation
- Local anesthetic toxicity
- Failed epidural or subarachnoid block
- Total spinal anesthesia

Amniotic Fluid Embolism

Definition
Classically, AFE is defined as resulting from entry of amniotic fluid through the uteroplacental or endocervical veins into the maternal circulation, causing profound cardiopulmonary compromise. More recent analyses have coined the term “anaphylactoid syndrome of pregnancy” which describes the syndrome of peripartum hypoxia, hemodynamic collapse
and coagulopathy seemingly resulting from maternal intravascular exposure to fetal tissue (likely at the cellular and molecular level). (Chesnut pg 689 quoting Clark et al)

Etiology
Either a direct communication of amniotic fluid with maternal veins, or a more subtle route of passage allowing fetal tissues to come into contact with maternal vascular endothelium.

Typical situations
- short or tumultuous labors
- cephalopelvic disproportion
- delivery of large fetuses
- use of uterine stimulants
- multiparous patients
- older parturients
- placenta previa

The analysis by Clark et al did not find a preponderance of tumultuous labors and they did not find a causative link between hypertonic contractions and AFE. AFE can occur during termination of pregnancy, labor, and vaginal or cesarean delivery.

Prevention
It has been recommended to avoid inappropriate use of uterine stimulants during labor

Manifestations
Early Phase
- Transient, but perhaps intense, pulmonary vasospasm
- Pulmonary artery hypertension
- Right heart dysfunction
- Decreased cardiac output
- Hypotension
- VQ mismatch
- Hypoxemia
- Respiratory distress:
  - Decreased oxygen saturation, cyanosis
  - Dyspnea, pleuritic chest pain, coughing, hemoptysis
- Bronchospasm
- Pulmonary edema
- Adult respiratory distress

Second Phase (if survive initial phase)
- Left ventricular failure
- Pulmonary edema
- Cardiac arrest
- CNS: hyperreflexia, headache, seizure, coma
- Further complications: Uterine atony, coagulopathy, DIC, massive hemorrhage

Similar Events
Pulmonary thromboembolism
Venous air embolism
Septic or hypovolemic shock
Myocardial infarction
Peripartum cardiomyopathy
Uterine rupture
Eclampsia
Local anesthetic toxicity
Total spinal anesthesia
Placental abruption
Cerebral vascular accident
Aspiration pneumonia
Anaphylaxis

Diagnosis of AFE is one of exclusion

Management
Call for help
OB team to apply fetal monitors and deliver expeditiously
Aggressive resuscitative measures
1. Initiate CPR if indicated
2. Intubate and ventilate with 100% FiO2
3. Perform aggressive volume resuscitation & CV support
   a. Establish IV access with several large bore catheters
   b. Insert a-line and a PA catheter
   c. Begin pressor and inotropic support
      i. Dopamine 2-5 mcg/kg/min
      ii. Dobutamine 15-30 mcg/kg/min
      iii. Norepinephrine 0.1-0.4 mcg/kg/min
      iv. Epinephrine 0.15-0.3 mcg/kg/min
4. Anticipate blood & blood products to treat hemorrhage & coagulopathy.
5. Manage sequelae of shock (cardiac failure, pulmonary edema, ARDS, renal failure, hepatic failure, neurologic sequelae)
6. Anticipate a prolonged ICU stay.

If patient has no pulse, begin ACLS maintaining left uterine displacement if beyond 13 weeks gestation.
If ACLS has proceeded for 4 minutes without return of pulse, decision should be made to perform emergent cesarean section.

Lab work
Send an ABG and treat acidosis
Obtain PT, PTT, fibrinogen, fibrin split products.
Type and cross for at least 4 units if DIC develops or cesarean likely
Begin transfusion with ratio of 6 units PRBC : 6 units FFP : 1 unit platelets
Other: urinary catheter, consider corticosteroids, consider other lab tests.
Diagnosis: Diagnosis of exclusion. Events producing similar presentation would include:
- PE
- VAE
- aspiration
- eclampsia
- local anesthetic toxicity
- shock (toxic, hemorrhagic, anaphylactic)
- acute heart failure
- intracranial hemorrhage

Complications
- Fetal distress or death
- Cardiac arrest
- Cerebral hemorrhage
- Cerebral anoxia
- Aspiration pneumonitis

Cardiac Arrest in the Parturient

Definition
The absence of effective mechanical activity of the heart, and in the spontaneously ventilating patient, cessation of effective ventilation in a parturient indicates cardiac arrest.

Etiology: (Consider broad differential, but keep in mind reversible and pregnancy-specific causes)
- Embolism: Amniotic fluid embolism, pulmonary embolism
- Acute coronary syndrome, arrhythmia, aortic dissection
- Hemorrhage
- Preeclampsia/Eclampsia
- Local anesthetic toxicity
- High spinal
- Hypermagnesemia
- Hypoxemia from failed intubation

Typical situations
- Difficult intubation
- Overdose of medication: total spinal, LA toxicity, tocolytic agent toxicity
- Parturients at high risk of hemorrhage: placenta previa, accrete, increta, percreta, placental abruption, uterine atony
- Acquired or congenital heart disease
- History of previous thromboembolic event

Prevention
Careful airway examination
Careful placement of epidural catheters, use appropriate test doses, dose incrementally
Anticoagulate patients with history of thromboembolism
Manage parturients with cardiac disease carefully: consult cardiology, treat chronic arrhythmias, consider placing invasive monitors during labor.
Careful administration of medications to parturients with history of drug allergies
Use beta-mimetic tocolytic agents with caution

**Manifestations**

- No palpable peripheral pulses
- Loss of consciousness or seizure in the awake parturient
- Absence of heart tones on auscultation
- Cessation of respiration in the spontaneously ventilating patient
- Cyanosis
- Arrhythmias
  - Ventricular fibrillation
  - Complete AV block without escape rhythm
  - Sinus arrest
  - EMD (?)
  - Asystole
  - PEA
- Bardycardia followed by asystole on the fetal heart rate monitor

**Similar Events**

- Hypotension
  - May be caused or exacerbated by lack of left uterine displacement
- Hypoxemia or cyanosis
- ECG artifact
- Seizures

**Management**

Verify cardiac arrest: check pulses, respiration, ECG
If cardiac arrest is present
  - Inform obstetrician and call for help
  - Start CPR
  - Follow management per ACLS protocols:

  **ACLS for the parturient:** (changes or additions from routine ACLS underlined)
  - **Primary Survey:** ABCD
    - **Airway:**
      - Check for patent airway → perform head tilt-chin lift or jaw thrust
      - → (if suspicion of injury, immobilize C spine)
    - **Breathing:**
      - Is patient moving air? → Give 2 rescue breaths—maintain cricoid pressure with PPV
    - **Circulation:**
      - Check for pulse/signs of circulation
      - → Place in left-uterine displacement if at 20 weeks gestation or more
→ Begin chest compressions at high-mid sternum. (Ratio of chest compressions to breaths 30:2)
→ Continue CPR
→ With two or more rescuers, rotate compressor responsibilities about every 2 minutes

Defibrillation:
   Attach AED, check rhythm
   → Standard pad positioning
   → Remove fetal monitors prior to shocks
   → Deliver shock for VF/pulseless VT
   → Resume CPR, beginning with compressions

Secondary Survey:
Airway:
Is airway adequate and protected? Are there signs of obstruction?
→ Remove obstructions, suction, insert oral AW or nasal trumpet, determine if advanced airway is needed.
→ Place advanced airway quickly, (RSI with cricoid pressure) and consider a smaller ETT
→ Adequately pre-oxygenate as FRC decreased, patient can rapidly desaturate
→ Monitor for excessive bleeding after insertion of any tube in the oropharynx or nasopharynx.

Breathing:
Confirm correct placement of airway, check for air movement, oxygenation
→ Confirm placement with ETCO2 detector
→ Given elevated diaphragm, hypoxemia develops more rapidly if O2 demand increased or pulmonary function compromised.
→ Modify ventilation strategy to optimize ventilation and oxygenation

Circulation:
Assess for heart rate, rhythm, blood pressure
Send blood sample for type and cross match
   → Establish IV access. Do not use lower extremities or femoral veins for venous access—drugs may not reach heart until fetus delivered.
   → Standard ACLS medication doses and defibrillation settings

Differential Diagnosis
Use Hs and Ts mnemonic
→ Decide whether to perform emergency hysterotomy. Best neonatal outcomes occur when fetus is delivered WITHIN 5 MINUTES of maternal cardiac arrest.

Complications
   CNS injury of mother or fetus
   Death of mother or fetus

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Hypotension Following Neuraxial Anesthesia

Definition
Hypotension following spinal or epidural blockade is a decrease in arterial blood pressure of more than 25% of baseline, an absolute value of systolic pressure below 90 mm Hg, or MAP below 60 mmHg.

Etiology
Sympathetic blockade from neuraxial anesthesia
Aortocaval compression

Typical Situations
High level of neuraxial blockade
Inadequate hydration prior to instituting neuraxial blockade
Failure to treat with vasopressor prior to induction of anesthesia
Parturients in the supine position without LUD

Prevention
Maintain left uterine displacement at all times
Administer a fluid bolus of non-glucose-containing crystalloid prior to instituting neuraxial blockade
Administer vasopressor prophylactically in patients undergoing spinal anesthesia for C/S (prior publications always suggest ephedrine, but current literature suggests phenylephrine is as good or better as fetal pH is higher in women treated with phenylephrine)

Manifestations
Fall in or low arterial pressure (systolic, diastolic or mean)
Nausea and vomiting in the conscious patient
Mental status changes
Arrhythmias
Weak or absent peripheral pulses
Inability of pulse oximeter or NIBP device to give a satisfactory reading
Decreased ETCO₂ or decreased O₂ saturation
Decreased urine output
Diminished heart sounds
Fetal bradycardia indicates decreased uteroplacental perfusion

Similar events
Artifact of BP measurement system
  Motion artifact with NIBP measurement
  Incorrect NIBP cuff size
  Transducer height artifact
  Faulty blood pressure transducer
Aortocaval compression
Hemorrhage
Amniotic fluid embolism  
Pulmonary or venous air embolism  
Total spinal anesthesia

Management
Expand circulating fluid volume prior to initiating neuraxial blockade
- One large-bore IV is usually adequate
- Labor epidural or saddle block (T10 level) infuse a bolus of at least 500 ml NS or LR
- For high epidural or spinal anesthetic (T4 level) for cesarean section, infuse 1500-2000 ml
- Alternatively, infuse 500 mL colloid with 1000 ml crystalloid

Monitor parturient frequently after initiating conduction blockade
- BP
- Level of sensory block

Administer prophylactic vasopressor if parturient has a spinal anesthetic:
- Ephedrine 5-10 mg IV at time of administration of local anesthetic
- Phenylephrine 50-100 mcg bolus, repeat as necessary or dilute phenylephrine infusion

Immediately check BP to rule out hypotension if
- Parturient complains of nausea or feeling faint
- Parturient is unresponsive to verbal stimuli
- Parturient complains of nasal congestion
- Fetal bradycardia or decelerations are observed (Persistent fetal distress requires immediate C/S)

If hypotension is diagnosed
- Place parturient in Trendelenburg position (10-20 degrees head down)
- If hypotension occurs immediately after spinal injection, use reverse Trendelenburg and treat BP aggressively; the head-down position will increase cephalad spread and worsen the hypotension
- Ensure adequate IV access
- Rapidly administer non-glucose containing crystalloid IV fluid
- Administer vasopressor (ephedrine 5-15 mg bolus, phenylephrine 25-100 mcg bolus, epinephrine 5-100 mcg bolus)

Ensure adequate oxygenation and ventilation
- Administer 100% O₂ by non-rebreathing face mask to the awake patient
- Intubate the trachea if there is loss of consciousness, respiratory failure or cardiovascular collapse
- Initiate mechanical ventilation using 100% FiO₂
- Monitor oxygenation by pulse oximetry

Complications
Cerebral or myocardial ischemia
Cardiac arrest
Aspiration of gastric contents
Pulmonary edema
Acute renal failure
Hypertension from treatment of artifact

Local Anesthetic Systemic Toxicity (LAST)

Definition
High blood levels of local anesthetics resulting in neurological symptoms, progressing to seizures and potential respiratory arrest. With even higher levels, cardiac arrhythmias and cardiac arrest can occur.

Etiology
High blood level of local anesthetic.

Typical situations
Inadvertent intravascular injection of local anesthetic during a nerve block, epidural catheter or caudal placement.
Systemic absorption of local anesthetic from neuraxial block, peripheral nerve blockade (or infiltration in plastic surgery).

Prevention
Frequent aspiration while injecting local anesthetic
Incremental dosing
Administration of a test dose with epinephrine in placement of an epidural catheter, and using dilute epinephrine in local anesthetic preparations for peripheral nerve blockade
Not exceeding the “maximum” recommended dose for a particular anesthetic

Manifestations
CNS: progression of restlessness, dizziness, tinnitus, perioral paresthesia, difficulty speaking, seizures, loss of consciousness.
Cardiovascular: increased blood pressure (due to sympathetic stimulation), bradycardia, depressed ventricular function, ventricular tachycardia and fibrillation.
(Chestnut 4th edition, pg 251)

Similar events
Eclampsia
CVA
Cardiac arrhythmia due to other causes
Cardiac arrest

Management

Recognize potential local anesthetic toxicity and call for help
Stop convulsions to prevent hypoxia and acidosis; benzodiazepines recommended as they don’t cause cardiac depression. Barbiturates and propofol acceptable (use lowest effective dose). Avoid propofol in patients with cardiovascular instability. Succinylcholine if seizures persist.
Secure airway: provide positive pressure ventilation with 100% FiO\textsubscript{2} with cricoid pressure
Endotracheal intubation
Support hemodynamics with left uterine displacement, IV fluids.
If in cardiac arrest, being ACLS with modification of beginning intralipid infusion immediately.
- Epinephrine may potentiate local anesthetic-induced arrhythmias; use 10-100 mcg boluses. \textit{Vasopressin no longer recommended! (ASRA Practice Advisory on LAST 2010)}
- For arrhythmia, consider amiodarone as first line agent over other local anesthetics.

Lipid emulsion: Begin IV administration of 20% intralipid.
Bolus 1.5 mL/kg over 1 minute
Infuse 0.25 mL/kg/min until circulation restored
May repeat bolus up to 3 mL/kg every 3-5 minutes and infusion may be increased to 0.5 mL/kg. Total maximum dose of 8 mL/kg is recommended
If fetus viable and immediate resuscitative efforts no successful, cesarean section should be performed quickly.
Decision should be made within 5 minutes to maximize chances for maternal and fetal survival.
Cardiopulmonary bypass will be required if circulation cannot be restored with these measures.

Complications

CNS injury to mother or fetus
Death of mother or fetus
** Fetus or newborn is no more vulnerable to toxic effects of local anesthetics than the adult, but the fetus does have fewer plasma proteins resulting in a higher free fraction of drug, and the acidotic fetus may promote ion trapping. (Chesnut chapter 12)
Aspiration of gastric contents

Obstetric Hemorrhage

Definition
An obstetric hemorrhage is an episode of acute blood loss related to pregnancy

Etiology
Placental pathology
Uterine pathology
Obstetric trauma
Coagulopathy

**Typical Situations**

**Placenta previa:** placenta located in lower uterine segment over the cervix
   - Risk: parturients with history of prior cesarean section, uterine surgery or *prior previa*, multiparous or older parturients

**Abruptio placentae:** premature separation of the placenta after 20th week of gestation
   - Risk: preeclampsia, trauma, increased parity, uterine anomalies including fibroid uterus, substance abuse (cocaine, tobacco, methadone)

**Placenta accreta, increta, percreta:** abnormal placentation in which placenta attaches to, into or through the myometrium (and into other viscera, usually bladder)
   - Risk: parturients with placenta previa, especially history of previous cesarean section

**Uterine rupture:**
   - Risk: patients with previous cesarean or uterine surgery, following prolonged labor, secondary to instrumentation during delivery.

**Uterine inversion:**
   - May be caused by traction on the umbilical cord after delivery without careful abdominal pressure on uterus.

**Uterine atony:**
   - Risk: multiparous patients, multiple gestation, polyhydramnios, macrosomia, chorioamnionitis, prolonged labor, augmented labor, tocolytic agent, volatile agent

**Retained placenta**

**Lacerations of cervix or vagina during delivery**
   - Risk: forceps deliveries, large fetal weight

**Coagulopathy:**
   - Risk: pre-existing bleeding diathesis, anticoagulant therapy, preeclampsia

**Structural anomalies of the cervix or uterus**

**Prevention**

- Identify parturients at high risk of obstetric hemorrhage
- Ensure adequate IV access and availability of blood for transfusion
- Prepare for pharmacologic treatment of uterine atony if necessary
- Monitor parturients carefully when oxytocin is administered
- Observe carefully during forceps delivery
- Monitor for and treat coagulopathies during labor and delivery

**Manifestations**

- Abnormal bleeding (from vagina, from surgical site during C/S)
- Decrease in blood pressure
- Increase in heart rate
- Fetal bradycardia or decelerations
- Decreased hemoglobin and hematocrit
- Evidence of coagulopathy or DIC (oozing from puncture sites, abnormal coagulation studies)
Similar Events
Anaphylactic or septic shock
Hypotension from other causes
Maternal dehydration
Fetal bleeding

Management
Check and verify blood pressure
Inform obstetrician and call for help (OB team should consider FHR monitoring)
Maintain left uterine displacement
Ensure adequate oxygenation and ventilation
  100% O₂ by face mask to the awake patient
  Intubate if loss of consciousness, respiratory failure, or cardiovascular collapse
  Monitor oxygenation by pulse oximetry
  Monitor ETT position and adequacy of ventilation via capnography
  Consider other more common causes of hypoxemia

Support Circulation
Treat severe hypotension with IV pressors: ephedrine or phenylephrine
  Treat with epinephrine if not responsive to other measures
Expand circulating volume
  Adequate IV access (at least two large bore IVs)
  Infuse blood, colloid or crystalloid rapidly
  Use a warmer for all IV fluids
  Prepare for massive transfusion → institute the massive transfusion protocol
Inform blood bank and have appropriate ratios of products ordered: 6 PRBCs to 6 FFP to 1 unit platelets
Have an assistant to set up cell saver or rapid transfusion device

If patient under GA
Decrease or discontinue all volatile anesthetics until hypotension has responded to therapy
Administer scopolamine IV 0.2-0.4 mg, for amnesia
Opiates and benzodiazepines may be given if hypotension has resolved

Treat uterine atony
Oxytocin IV: Administer 2-3 unit bolus and add 20-40 units to 250-1000 ml NS for infusion
Methylergonovine (Methergine):
  Administer 0.2 mg IM if uterine atony continues
  Administer 0.2 mg IV only in life-threatening situations: dilute into 10 mls, give slowly in divided doses while monitoring BP.
  May cause severe hypertension and intracranial hemorrhage
Prostaglandin F2-alpha (carboprost, Hemabate): may be administered by OB intrauterine or IM, 250 mcg
  May cause bronchospasm, nausea, vomiting, hypotension, hypertension
Keep the obstetrician informed of the parturient’s hemodynamic status
If possible, OB should hold pressure on site. Other procedures performed occasionally: B-lynch suture or placement of Bacri balloon. If profound shock, OB may need to clamp uterine or iliac vessels, or perform a hysterectomy. If hemorrhage continues or is a severe problem, send blood to the lab for: ABG, hematocrit, coagulation studies (PT, PTT, platelet count, fibrinogen, fibrin split products), ionized calcium and serum potassium

**Complications**
Cerebral or myocardial ischemia or injury
Aspiration pneumonitis
Transfusion reaction
Acute renal failure
Hypocalcemia
Hyperkalemia
Hypothermia
Coagulopathy/DIC
Volume overload
ARDS/TRALI
Bloodborne infection

**Preeclampsia and Eclampsia**

**Definition:** Preeclampsia is a multisystem syndrome of parturients involving hypertension, peripheral edema, and proteinuria
Diagnosis requires at least two of these three major signs in a parturient whose pregnancy is beyond 20 weeks gestation or who has a molar pregnancy
If seizures have occurred the syndrome is termed *eclampsia*

**Etiology:** Uncertain

**Typical Situations:**
Parturients with pre-existing medical conditions
- Hypertension
- Morbid obesity
- Renal disease
- Sickle cell anemia or other hemoglobinopathies
- Systemic lupus erythematosus or other collagen vascular diseases
Parturients with no prenatal care
Parturients with a history of preeclampsia
Molar pregnancy
Extremes of maternal age
Nulliparous parturient

**Prevention:**
Identify patients at risk of preeclampsia
Obstetricians may attempt to provide prophylaxis with one of these modalities:
Aspirin: in low doses, early studies suggested it could help prevent preeclampsia by increasing PGI2 and decreasing TXA2. Later studies have not confirmed those results.
Calcium: Epidemiologic studies suggest an inverse relationship between calcium intake and preeclampsia. A clinical trial did not demonstrate a difference among healthy nulliparous women.
Antioxidant prophylaxis: no large RCTs have been done

**Manifestations:**

**Hypertension,** defined as
- SBP > 140 mm Hg or more than 30 mm Hg above baseline
- Diastolic BP > 90 or more than 15 mm Hg above baseline

**Proteinuria,** defined as
- More than 0.3 g protein/L of urine in 24 hour period (1-2+ on dipstick)

**Edema**
- Must be generalized (facial or upper extremity) as opposed to dependent edema seen frequently in lower extremities of normal pregnant women

As preeclampsia becomes more severe, systemic manifestations become more pronounced
Cardiopulmonary: severe HTN, pulmonary HTN, decreased cardiac output, CHF
Pulmonary edema: secondary to CHF, or secondary to pulmonary capillary leak
Renal: increased proteinuria, decreased renal blood flow, decreased GFR, elevated serum creatinine, elevated uric acid, proteinuria, oliguria, acute renal failure.
CNS: Hyperreflexia, clonus, headache, visual changes, somnolence, CNS irritability, cerebral edema, seizures, ICH
Hematologic: platelet dysfunction with or without thrombocytopenia, elevated PT, PTT, fibrin split products. An elevated hematocrit reflects a decreased intravascular volume.
HELLP syndrome
Epigastric pain, RUQ pain
Obstetric complications: increased uterine irritability, decreased uterine blood flow, preterm labor, placental abruption, intrauterine growth retardation, fetal distress

**Similar events:**

HTN: essential hypertension, gestational hypertension with out preeclampsia
Preexisting congenital or acquired cardiac disease
Preexisting renal disease
Seizures from other causes
Coagulopathy or DIC from other causes
Preexisting pulmonary disease

**Management:**

*These patients are at higher risk of fetal distress and may require urgent or emergent cesarean section. Early evaluation of airway, cardiac, pulmonary, and coagulation status will allow preparation for possible anesthetic intervention.*
For labor, consider epidural analgesia
- EA will decrease catecholamine release and may improve uterine blood flow
Use EA cautiously in parturients who may not tolerate fluid loading (cerebral edema present, cardiac, pulmonary or renal function compromised). PA catheter may assist in fluid management.

Check platelet count (*and bleeding time?) prior to placing lumbar epidural

Slow initiation of epidural blockade will minimize the hypotensive effects of sympathectomy

Test dose should NOT contain epinephrine ** ?

If C/S becomes necessary, surgical anesthesia can be provided via the existing epidural catheter

Control the progression of preeclampsia, control blood pressure, and protect the fetus

Expand circulating volume

Administer MgSO4 IV, 4-6 gram bolus over 15 minutes, followed by infusion of 1-3 g/hr

Mg2+ has anticonvulsant and tocolytic actions, mild vasodilator

Mg2+ enhances neuromuscular blockade of both nondepolarizing and depolarizing muscle relaxants

Administer antihypertensive medications as necessary to maintain diastolic blood pressure (** at approximately 100 mm Hg)

Nifedipine SL 10 mg
Labetalol 5-10 mg IV bolus
Hydralazine IV 5-10 mg bolus
Sodium nitroprusside IV infusion, 0.25-2 mcg/kg/min
NTG IV infusion, 0.5-3 mcg/kg/min

Intra-arterial pressure monitoring is indicated if infusions are administered

If patient is oliguric
If O2 sat low and pt has signs of CHF, place a PA catheter prior to fluid administration

Optimize myocardial filling pressures
If O2 saturation is normal and no symptoms or signs of CHF

Administer crystalloid or colloid in 250 mL boluses
If urine output does not increase after 1000-2500 mL, place CVP or PA catheter

If seizures occur:
100% O2
Cricoid pressure if mask ventilating
Intubate trachea—may need small ETT
Administer anticonvulsant

Thiopental 50-100 mg IV (or propofol)
Diazepam 2.5-5 mg IV
Midazolam 1-2 mg IV
Mg SO4 IV 2-4 mg—continue via infusion
Maintain left uterine displacement
If GA required for C/S
  Consider placing A-line
  Consider aggressive control of HTN prior to induction and emergence
  Sodium nitroprusside infusion, labetalol, esmolol, fentanyl

Complications:
Fetal distress
Coagulopathy
Severe hemorrhage
Difficult endotracheal intubation
Intracranial hemorrhage
Cerebral edema
Myocardial, respiratory, renal or hepatic failure
Subcapsular hematoma of liver, hepatic rupture
Code “OB”  
(Mobilization of Resources for Obstetric Emergencies)

- Care team suspects hemorrhage, arrest, or other Ob crisis

  - Call Code OB – push “CODE” button
  - Patient still in her room: Primary team – Ob MD, RN
    - Back up RN to room: Help with:
    - Clerk: Page the following in order:
      - Page OB attending
      - Page 3rd year OB resident
      - Emergency pager 9519931
      - Page to 22603911*## (room#)
      - Anesthesia attending
      - Anesthesia resident
    - Identify porter: (Clerk, intern or medical student)
      - Page OB attending
      - Page 3rd year OB resident
      - Emergency pager 9519931
      - Page to 22603911*## (room#)
      - Anesthesia attending
      - Anesthesia resident

  - Pulseless & Pregnant
    - CPR & C-section in the bed
    - Transfer to L&D OR –
      - Arrival to L&D OR suite:
        - RN to assist anesthesia with monitors and 2nd IV
        - RN obtains 2 units of O neg blood from HemoNine
        - ♦ Report given to Anesthesia and OB attendings by member of initial team
        - ✔ Vital Signs & Current Interventions
        - ✔ EBL: Anesthesia attending initiates Massive Transfusion Protocol if more than 4U PRBC needed
        - ✔ Pertinent history and labs
      - Scrub Tech to open
        - To get care for baby call:
          - NBICU if still
        - Blood Bank: 2-2591
        - Initiate Massive
        - Alert Backup Ob

      - Have debriefing ses-
Massive Transfusion Protocol – UNMH

(See also section on Hemorrhage/MH cart)

Criteria for initiating MTP: potential need for > 1 blood volume in 24 hours or ½ blood volume in <3 hours

Designation of person responsible for initiating MTP:
   a. Trauma Bay – person who is running trauma
   b. OR – Anesthesiologist

2. Initiation of MTP
   a. Person or designee calls blood bank at 2-2591 to initiate MTP, orders the MTP powerplan on computer (instructions posted by computers)
   b. Send the following samples to the lab:
      i. Type and cross (pink top tube x1– or lavender)
      ii. CBC (lavender top x1)
      iii. Fibrinogen, PT, PTT(light blue top x 2)
      iv. iCa, Lactate (green top)
      v. ABG
      vi. TRAP-UA
   c. Notify medical director/blood bank attending on call/path resident on call
   d. Lab/Chemistry notified all samples from patient processed STAT

3. Use uncrossmatched RBCs until type-specific products available (30-40 min)
   a. use emergency O negs in refrigerators, (usually 2 available at a time)
   b. all products should be warmed

4. Blood bank delivers 1st MTP pack
   a. Transport paged to deliver MTP packs and further samples
   b. MTP pack consists of: 6 units pRBCs, 6 units thawed plasma, 1 unit pheresis platelets
   c. MTP pack will be delivered in 2 phases, separated by 30 minutes (unless otherwise instructed by ordering physicians)
      i. 1st phase: 3U pRBCs, 3U FFP, 1U pheresis platelets
      ii. 2nd phase: 3U pRBCs, 3U FFP
   d. Redraw labs q hour during MTP (ABG, CBC, PT, PTT, Fibrinogen, Lactate, iCa)
      i. Lavender top x 1
      ii. Light blue top x 2
      iii. Green top x 1

5. Assess hemostasis
   a. If bleeding controlled and no oozing, deactivate MTP by calling blood bank
   b. If bleeding uncontrolled, order additional MTP pack
   c. Labs will automatically be drawn for 1st 2 hours after deactivation
      i. PT/fibrinogen/CBC/Chem7/iCa
   d. Trauma/ICU team to transfuse specific products on as-needed basis once MTP deactivated
6. Additional MTP components
   a. If fibrinogen <160, give cryoprecipitate (10 units)
   b. Consider giving rFVIIa after the first MTP pack if bleeding is still uncontrolled. (Order from Main Pharmacy 22033) The dose is 90 mcg/kg.

Evidence for early platelets:

2 cohort studies (Cosgriff and Cinat) looked at survival of massively transfused patients and found greater survival with the following ratio: platelet/PRBC 0.79
Our protocol: assuming maximal use of non-crossmatched units (4U), the ratio is 0.6 after 1 MTP pack. If 2 units uncrossmatched (instead of 4) used, ratio is 0.75.

References:


Malone, D. et al. Masive transfusion practices around the globe and a suggestion for a common massive transfusion protocol. *J Trauma*. 2006;60:S91-S96


APPENDIX

Pain during childbirth: What can we do about it?

Women have different levels of pain and prefer different methods of pain relief during childbirth. Some women get enough pain relief with breathing and relaxation techniques. Others will choose to receive pain medications given into a vein (“IV”) to help dull the pain. About a third of our patients ask for an epidural block for pain relief. This teaching sheet talks about medications and anesthesia.

**Intravenous (“IV”) medications** help you to deal with the pain of labor but they do not stop the pain completely. Side effects may include nausea, vomiting and itching. Since they can make you and your baby sleepy, we give you less towards the end of your labor. IV medications are ordered for you by your doctor or midwife and they are given to you by your nurse.

**Epidural block** for labor is an injection of medications between the bones of your lower back, next to the spinal sac. This gives you almost complete or complete pain relief in most cases. It numbs the lower part of the body without making you or your baby sleepy but many people do fall asleep because they don’t feel pain anymore. The epidural block is used for labor pains as well as for cesarean sections. It is performed under the supervision of a specialist doctor called an anesthesiologist.

How is the epidural block done?
The epidural block is given in the lower back, below the end of the spinal cord. You will be sitting or lying on your side. You will put your chin to your chest and push your lower back outwards like the letter C. This will help open the space between the backbones.
The anesthesiologist will numb your skin with local anesthetic (like Novocaine). Through the numb skin a special needle is used to find the epidural space which is just outside the spinal sac. A small tube called an epidural catheter is placed through this needle and into the epidural space. The catheter is like a very thin IV tubing. The needle is then taken out and the epidural catheter is left in your back until your baby is born.
Without any more needle sticks a small, test dose of medicine will be given through the epidural catheter to make sure that the tip is not in a blood vessel or in the spinal sac. Then the catheter is taped to your skin. More medicine injected through the epidural catheter will relieve your pain in 10-20 minutes. The medicine will often make your leg muscles weaker for the duration of the block.
A continuous infusion of medication will be given through the epidural catheter. This will keep you comfortable throughout your labor. You may choose to have “patient controlled epidural analgesia” (PCEA). By this method you can control the amount of medication you receive by pushing a button.
Once the epidural has relieved your pain, your nurse will place a tube in your bladder to keep it empty. You may not eat until your baby is born. Because your leg muscles will be weak, it
is important that you do not attempt to get out of bed until the effects of the epidural have worn off. Make sure that your nurse is at your bedside the first time you try to walk.

What are the risks of the epidural block?

Rarely complications or side effects can occur, even though you are watched carefully:

- Your blood pressure may drop and you may feel nauseated or light headed for a few minutes. We can quickly treat this by turning you on your side and giving you fluids and medications I.V.

- An epidural may not work because the tip of the catheter is in a vein. We find out about this after the test dose. We pull out and replace most of these catheters.

- If the epidural needle goes too far it will make a hole in the spinal sac. You can decrease the chance of that by holding still during the needle placement. If a hole is made in the spinal sac we will often place the catheter through it. These “spinal catheters” are better than the epidural catheters in controlling your pain but you may develop a headache the next day. Some of these headaches will need further treatment.

- Nerve problems in the legs after childbirth are just as common in women who do not have epidurals as in women who do. These nerve problems are almost always caused by the baby’s head pushing on nerves along the birth canal, and are very rarely due to epidural anesthesia. If you experience any weakness in the legs or other nerve problems, your anesthesiologist will help to evaluate the problem and make sure you have proper follow up.

- Major complications such as nerve damage, paralysis or infection are extremely rare (less than 1 in 20,000 cases)

How will the epidural block affect my labor? Are there risks or side effects?

Women who use epidurals do not appear to be more likely to need a cesarean delivery or have the length of their entire labor prolonged. Epidurals may prolong the second stage of labor for some women, when you are pushing your baby out of your body.

Women who use epidurals are more likely to need a vacuum extractor put on their baby’s head to help pull the baby out of their body. This may make your perineum (area between the vagina and the anus) more likely to tear during delivery.

Using an epidural does not increase infection in mothers and babies but might make your temperature go up. Then your baby might need blood tests and antibiotics.

What if I need a cesarean section?
Cesarean section (C-section) deliveries can be performed safely under epidural, spinal or general anesthesia. Choices depend on your medical condition, your baby’s condition and when possible, your preferences.
Some patients are considered to be at high risk for requiring a cesarean section for their delivery. This may be due to concerns with the health of you, your placenta or your baby. Your doctor or midwife will let you know if you fall into one of these groups. If you fall into one of these groups you may be encouraged to have an epidural placed. This would be to provide the safest care for you and your baby.

**Epidural anesthesia** is usually used when a patient has already had an epidural catheter placed for attempted vaginal delivery. The patient has been unable to deliver vaginally and her physician has chosen to deliver the baby by cesarean section. A much stronger drug can be injected in the epidural catheter. This will allow you to have a pain free cesarean section while remaining awake throughout the procedure.

**Spinal anesthesia** is given with a very thin needle that is advanced between the bones of the lower back into the spinal sac, below the end of the spinal cord. A small amount of medication injected into the spinal fluid quickly numbs your body from your toes to your chest. Since the spinal needles used today are so thin, the hole made in the spinal sac is small and the chances for a headache are very low.

**General anesthesia** is used most often when an emergency cesarean section is needed. It can be started very quickly by giving medications into your vein to put you to sleep. After you are asleep a breathing tube is placed through your mouth into your windpipe (trachea). It is important that you do not eat anything after your active labor pains begin. This is because stomach contents could come up and go into your lungs causing a life threatening pneumonia.

It is our goal to help you understand your choices for pain relief and support your decisions. Please discuss your pain relief options and possible side effects with the providers of your obstetric care. If necessary, a consultation with an anesthesiologist can be arranged before your due date.

You may find more information on [http://www.brighamandwomens.org/painfreebirthing/](http://www.brighamandwomens.org/painfreebirthing/)
Primary OB Anesthesia Rotation Educational Documentation

Resident Name ______________________Month/Year ______________________

Topics

1. The most common emergencies: emergency Cesarean delivery and post-partum hemorrhage

2. Other crisis topics:
   a. Failed intubation, difficult airway, and aspiration
   b. High spinal
   c. Maternal embolic events
   d. CPR in the obstetric patient
   e. Seizures in obstetrics, differential diagnosis and management

3. Maternal physiology

4. Fetal physiology and assessment; fetal and neonatal resuscitation

5. Non-regional labor analgesia (systemic, inhalation, non-pharmacologic)

6. Regional analgesia for labor and delivery; local anesthetics

7. Complications of neuraxial anesthesia:
   a. Hypotension
   b. Local anesthetic systemic toxicity
   c. Unintentional dural puncture
   d. Neural injury
   e. Epidural abscess/meningitis

8. Neuraxial opioids for obstetrics

9. Anesthesia for Cesarean delivery

10. Anesthesia for post-partum tubal ligation

11. Anesthetic considerations in preeclampsia and eclampsia *

12. Obesity/morbid obesity *

13. Diabetes mellitus *

14. Anesthesia for surgery during pregnancy
Advanced OB Anesthesia Rotation Educational Documentation

Resident Name _____________________________
Month/Year ______________________

Topics

1. Fetal and Neonatal Resuscitation
2. Non Regional Labor Analgesia
3. Aspiration
4. Neurologic complications of anesthesia
5. Asthma and ARDS *
6. Cardiac Disease *
7. Neurologic disease *
8. Musculoskeletal disease *
9. Hematologic & coagulation disorders*
10. Autoimmune disorders *
11. Substance abuse *
12. Renal disease *
13. Liver disease *
14. HIV*
15. Thyroid disease *
16. Ethical Issues